Installation and Operating Instructions

SmartWire PS3

Digital energy meter for single and three-phase electrical systems

Introduction

Havells SmartWire solution revolutionises meter installation within panel board applications utilising plug and play technology. This manual will provide all the necessary instructions to install and operate this instrument. Additional information regarding assembly within the panel board can be found at the end of this manual.

Measurement

In measurement mode, the buttons control the displayed measurement as follows:

V/Hz	Selects the Voltage and Frequency display screens. Successive operations of the button select voltage, frequency, and %THD (Total Harmonic Distortion). In set-up mode, this is the 'Back' button.
A	Selects the Current display screens. Successive operations select phase and neutral (3ph4w) currents, max. demanded currents, and current %THD. In set-up mode, this is the 'Up' button.
P/PF	Selects the Instantaneous Power screens. Successive operations select power (W, VAr & VA), max. demanded power, and power factor. In set-up mode, this is the 'Down' button.
E	Selects the Energy display screens. Successive operations select imported Wh and Varh. Display can indicate up to 9999999·9. In set-up mode, this is the 'Enter' button.

Setting up

- Press and hold the two outermost buttons V/Hz and E simultaneously for five seconds until the password screen is displayed.

- Press E four times to enter the default password of "0000".
- The system setup screen will be displayed on the screen. Press the P/PF button to scroll down the menu until you see the CT primary setting screen.

- Press the E button to enter the CT primary setting screen. The first digit should start flashing.
- Use the A and P/PF buttons to set the digit to the required value then press E to confirm. Repeat this process until all four digits have been set to the desired CT primary value (e.g. 100A = 0100A, 1000A = 1000A).
- The word "SET" will be displayed after the fourth digit has been entered to confirm that the primary CT value has been set.
- Press V/Hz to return to the first level menu structure. Use the A and P/PF buttons to scroll up and down the menu structure to adjust another parameter. If no other settings are required, press V/Hz to exit set-up mode and return to measurement mode.

Setup Menu Structure

Change password
nnnn - 4-digit number – default '0000'

Supply systems
3-phase 4-wire or Single phase

CT Set maximum current that can be monitored according to CT in use, *nnnn* – 4-digit number 0001 to 9999

Demand Interval Time
Selects demand time in minutes – 60/30/20/15/10/8/5/OFF

Reset Resets cumulative energy and Demand measurements to zero

Communication parameters for RS485 interface
Modbus™ protocol
Baud rate 2400/4800/9600/19200/38400
Parity none/odd/even
Stop bits 1 (1 or 2 if parity is none)
RS485 network address nnn – 3-digit number 1 to 247
Order – Norm/Rev indicates if the Modbus™ word order is normal or reversed.
Johnson Controls (JC) N2 protocol
RS485 network address *nnn* – 3-digit number 1 to 255

Relay pulse output
kWh/kVArh/Off (Active/reactive – Import only)
Rate 1/10/100/1000/10,000 kWh or kVArh per pulse
Pulse width 200/100/60 ms

Default ON selects default kWh screen at startup and fall-back. OFF selects screen chosen remotely via Modbus™.

Energy kilo / Mega

Test Phase sequence
Display on – all elements on to check display
Display toggle - Each element is turned on and off

SOFT Displays firmware version numbers

Menu Option Selection

1. After entering the correct password, use the A and P/PF buttons to navigate up and down the first level until the desired parameter is reached. Selection does not roll over from bottom to top of list or vice versa.
2. Press the E button to select the desired parameter and enter the second level menu structure.
3. If an item flashes then it can be adjusted by the A and P/PF keys. If not, there may be a further layer, e.g. Comms - Baud rate, before adjustment is possible. Press E to select the lower layer.
4. Having selected an option from the current menu layer, press E to confirm your selection. The SET indicator will appear.

5. Once all the necessary selections have been made and the required settings entered, press V/Hz to return to the first level menu structure. The word SET will go off and one can then use the A and P/PF keys for further menu selection.

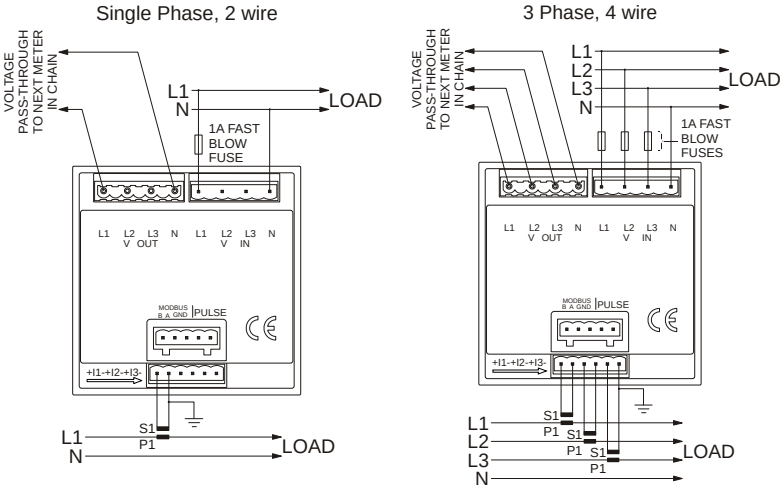
6. On completion of all setting-up, press V/Hz repeatedly until the measurement screen is restored. If no other setting is required, press V/Hz to exit set-up mode and return to measurement mode.

Number Entry Procedure

When setting up the unit, some screens require the entry of a number. In particular, to enter the setting up section a password must be entered. Digits are set individually, from left to right. The procedure is as follows:

1. The current digit to be set flashes and is set using the A and P/PF keys.
2. Press E to confirm each digit setting. The word SET will be displayed once the last digit has been set.
3. After setting the last digit, press V/Hz to exit the number setting routine.

Installation



The unit may be mounted in a panel of any thickness up to a maximum of 6mm (0·25in). Leave enough space behind the instrument to allow for bends in the connection cables. As the front of panel enclosure conforms to IP52, it is protected from dripping water. The unit is intended for use in a reasonably stable ambient temperature within the range -10 to +55°C. Do not mount the unit where there is excessive vibration or in excessive direct sunlight.

As the unit derives its internal power from phase L1 of the measuring voltage, for operation terminals L1 and N must always be connected and the applied voltage must be kept within the specified range of use.

Safety

The unit is designed in accordance with BS EN 61010-1:2001 (IEC 61010-1:2001) – Permanently connected use, Normal condition. Installation category III, pollution degree 2, basic insulation for rated voltage. Measurement Category III.

EMC Installation Requirements

Whilst this unit complies with all relevant EU EMC (electro-magnetic compatibility) regulations, any additional precautions necessary to provide proper operation of this and adjacent equipment will be installation dependent and so the following can only be general guidance:

- Avoid routing wiring to this unit alongside cables and products that are, or could be, a source of interference.

Warnings

Caution: Risk of Electric Shock

- **During normal operation, voltages hazardous to life may be present at some of the terminals of this unit.**
- **At voltages below that specified in the Range of Use the meter may shut down. However, voltages hazardous to life may still be present at some of the terminals of this unit.**
- **Installation and servicing should be performed only by qualified, properly trained personnel abiding by local regulations.**
- **Ensure all supplies are de-energised before attempting connection or other procedures.**
- **Terminals should not be user accessible after installation and external installation provisions must be sufficient to prevent hazards under fault conditions.**
- **This unit is not intended to function as part of a system providing the sole means of fault protection - good engineering practice dictates that any critical function be protected by at least two independent and diverse means.**
- **The unit does not have internal fuses therefore external fuses must be used for protection and safety under fault conditions.**
- **Never open-circuit the secondary winding of an energized current transformer.**
- **This product should only be operated with CT secondary connections Earthed.**
- **If this equipment is used in a manner not specified by the manufacturer, protection provided by the equipment may be impaired.**
- **Auxiliary circuits (communication & relay outputs) are separated from the metering inputs by at least basic insulation. Such auxiliary circuit terminals are only suitable for connection to equipment which has no user accessible live parts. The insulation for such auxiliary circuits must be rated for the highest voltage connected to the instrument and suitable for single fault condition. The connection at the remote end of such auxiliary circuits should not be accessible in normal use. Depending on application, equipment connected to auxiliary circuits may vary widely. The choice of connected equipment or combination of equipment should not diminish the level of user protection specified.**

- The supply to the unit should not be subject to excessive interference. In some cases, a supply line filter may be required.
- To protect the product against incorrect operation or permanent damage, surge transients must be controlled. It is good EMC practice to suppress transients and surges at the source. The unit has been designed to automatically recover from typical transients; however in extreme circumstances it may be necessary to temporarily disconnect the supply for a period of greater than 10 seconds to restore correct operation.
- Screened communication leads are recommended and may be required. These and other connecting leads may require the fitting of RF suppression components, such as ferrite absorbers, line filters etc., if RF fields cause problems.
- It is good practice to install sensitive electronic instruments that are performing critical functions in EMC enclosures that protect against electrical interference causing a disturbance in function.

Wiring

Connections are made via two-part connectors with screw clamp terminals. Choice of cable should meet local regulations for the operating voltage and current. **The current inputs of this product are designed for connection into systems via current transformers only.** Instrument transformers used for connection to the meter must be of approved type and compliant with ANSI/IEEE C57.13 or IEC 60044-1, selected and sized appropriate to the supply network being monitored. All negative current inputs are commoned inside the unit. To minimise measurement errors the CTs should be grounded at one point only, as shown in the wiring diagram. CT secondaries must be grounded in accordance with local regulations. It is desirable to make provision for shorting links to be made across CTs to permit easy replacement of a unit should this ever be necessary.

Connector plugs are suitable for copper wires only and will accept one stranded 0·05 – 2·5mm^2 (30 - 12AWG) stranded or solid core cables. This instrument is intended for panel mounting. Terminals must be enclosed within the panel. For mains terminals use wire rated at 600V, 60°C minimum temperature. Terminal screws are fully tightened for shipment and must be undone before wire insertion. Terminal screws should be tightened to 0·5 Nm (4·4 lbf in) only.

Fusing

This unit must be installed with external fuses in the voltage supply lines of type fast blow 1A maximum. Choose fuses of a type and with a breaking capacity appropriate to the supply and in accordance with local regulations.

A suitable switch or circuit breaker conforming to the relevant parts of IEC 60947-1 and IEC 60947-3 should be included in the installation. It should be positioned so as to be easy to operate, in close proximity to the equipment, and clearly identified as the disconnecting device.

Earth/Ground Connections

For safety reasons, current transformer secondary connections should be grounded in accordance with local regulations. Under no circumstances should the product be operated without this Earth connection.

Maintenance

In normal use, little maintenance is needed. As appropriate for service conditions, isolate from electrical power, inspect the unit, and remove any dust or other foreign material present. Periodically check all connections for freedom from corrosion and screw tightness, particularly if vibration is present.

The front of the case should be wiped with a dry cloth only. Use minimal pressure, especially over the viewing window area. If necessary wipe the rear case with a dry cloth. If a cleaning agent is necessary, isopropyl alcohol is the only recommended agent and should be used sparingly. Water should not be used. If the rear case exterior or terminals should be contaminated accidentally with water, the unit must be thoroughly dried before further service. Should it be suspected that water might have entered the unit, factory inspection and refurbishment is recommended.

Specification

Measurement Inputs

Imported energies are recorded.

Three current inputs (six physical terminals) with 2·5mm^2 stranded wire capacity for connection of external CTs.

Voltage inputs and outputs through 4-way connectors with 2·5mm^2 stranded wire capacity. 3-Phase 4-wire unbalanced and Single-phase 2-wire. Line frequency measured from L1 voltage or L3 voltage.

Direct measurement of 173 to 500Vac L-L (100 to 289Vac L-N).

Range of Use

Values of measured quantities, components of measured quantities, and quantities which affect measurement errors to some degree, for which the product gives meaningful readings:

Voltage	31 … 120% of Range Maximum
Current	1 … 120% of nominal
Active power	1 … 144% of nominal, 360MW maximum
Apparent power	1 … 144% of nominal, 360MVA maximum

Power is only registered when voltage and current are within their respective range of use.

Accuracy

Voltage (V)	0·5% of range maximum
Current (A)	0·5% of range maximum
Neutral current calculated (A)	4% of range maximum
Frequency (Hz)	0·11 Hz
Power factor (PF)	1% of unity
Active power (W)	± 1% of range maximum
Reactive power (VAr)	± 1% of range maximum
Apparent power (VA)	± 1% of range maximum
Active energy (kWh)	Class 1 (IEC 62053-21) section 4.6
Reactive energy (kVArh)	± 1% of range maximum
THD	1% up to 31st harmonic
Response time to step input	1s typical to >99% of final value

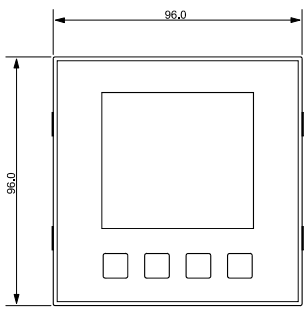
Pulsed output relays

Contact rating	50mA max at 250V AC/DC for general switching applications
Type	Solid state relay

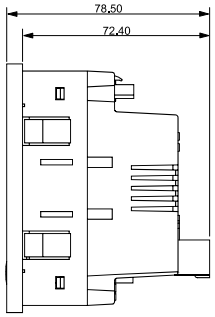
RS485 output

Type	2-wire half duplex
Baud rate	2400, 4800, 9600, 19200, 38400

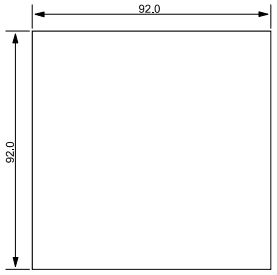
*Ensure any external circuits connected to either relay or RS-485 output modules are provided with double/reinforced insulation.



Front View



Side View



Panel Cutout

Reference Conditions of Influence Quantities

Influence Quantities are variables that affect measurement errors to a minor degree. Accuracy is verified under nominal value (within the specified tolerance) of these conditions.

Ambient temperature	23°C ±1°C
Input waveform	50 or 60Hz ±2%
Input waveform	Sinusoidal (distortion factor <0·005)
Magnetic field of external origin	Terrestrial flux

Environment

Operating temperature	-10°C to +55°C*
Storage temperature	-20°C to +70°C*

*Maximum operating and storage temperatures are in the context of typical daily and seasonal variation.

Relative humidity	0 to 90%, non-condensing
Altitude	Up to 2000m
Warm up time	1 minute
Vibration	10Hz to 50Hz, IEC 60068-2-6, 2g
Shock	30g in 3 planes
Dielectric voltage withstand test	2.2kV rms 50Hz for 1 minute between Measuring Voltage Inputs to RS485 and Relay.

Front Face Only

Mechanics

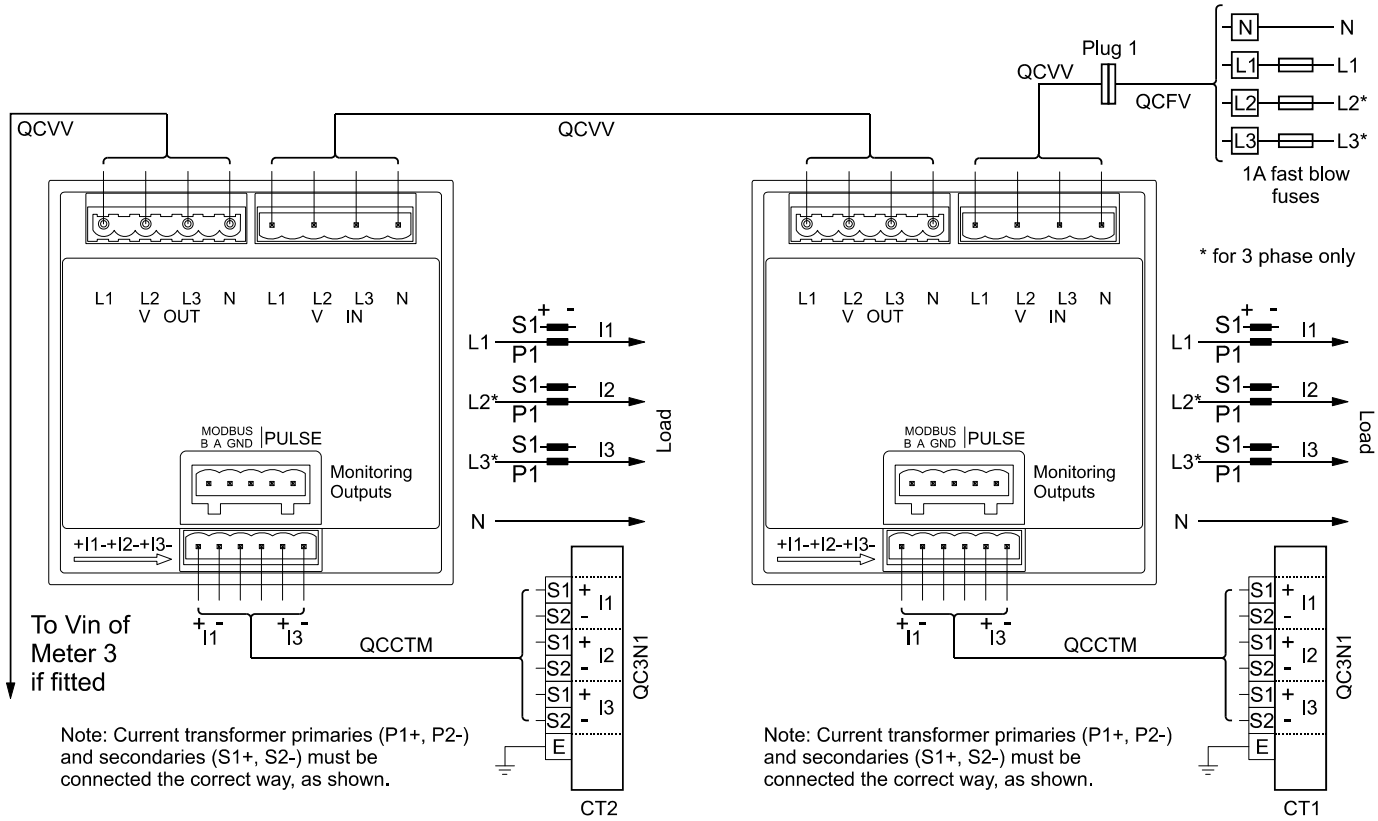
Dimensions	96 × 96 mm (L×W)
Depth (behind panel)	61 mm maximum
Case protrusion (front of panel)	6·5 mm maximum
Sealing	IP52 (front panel), IP30 (case) (minimum)
Mounting	DIN 96 panel mounting

Approval, Certification, and Standards Compliance

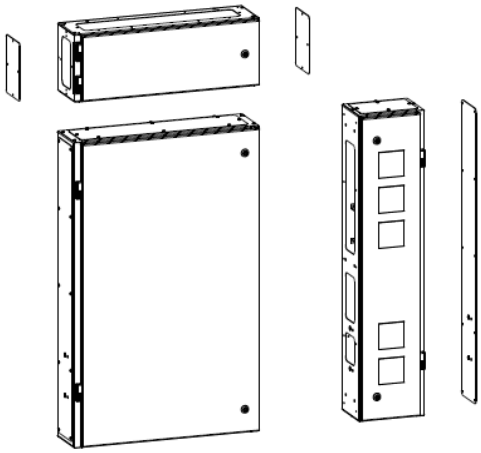
EMC, Emissions	BS EN 61326, Class A (Industrial)
EMC, Immunity	BS EN 61326, Class A (Industrial)
Safety	BS EN 61010-1:2001

Specification Input

Nominal input voltage	100 to 289V AC L-N
Max. continuous input overload voltage	120% of nominal
Max. short duration input voltage	2 x range maximum (1 second application repeated 5 times at 5 minute intervals)
Nominal input voltage burden	5VA nominal L1-N, < 0·2VA all other phases
Nominal input current	5A AC rms
Max. continuous input overload current	120% of nominal
Max. short duration input current	10 x nominal (1 second application repeated 5 times at 5 minute intervals)
Frequency	45 to 66Hz



Havells SmartWire solution revolutionises meter installation within panel board applications utilising plug and play technology.



The following instructions provide detailed guidelines on how to install Havells SmartWire metering solution into PowerSafe MCCB panelboards

1.0. Incoming Metering (PSPBS250SW, PSPBS400SW, PSPB630SW)

1.1. CT Fitment – 250A

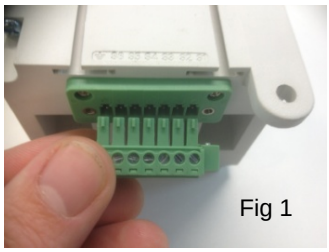


Fig 1

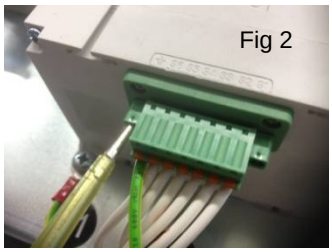


Fig 2

Step 1: Remove Incoming MCCB shroud. Remove CT shorting link and retain for future use as per figure 1.

Step 2: Connect CT Loom to CT by pushing plug connector as per figure 2 and fastened as necessary.

Step 3: Align CT ground cable ring terminal with CT mounting foot and place fastener to retain grounding cable.

Step 4: Fit CT to mounting plate using the supplied fasteners. This can be completed before or after cables have been passed through CT aperture.

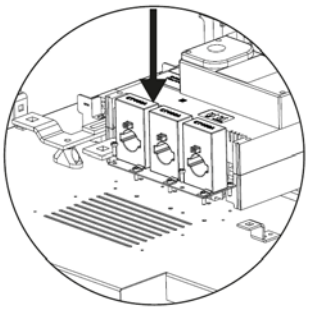


Fig 3

1.2. CT Fitment – 400/630A

Step 1: Fit mounting kit with CT direct to mounting plate as shown, fig 3

Step 2: Pass copper palms through CT aperture and fasten to torque setting accordingly fig 4.

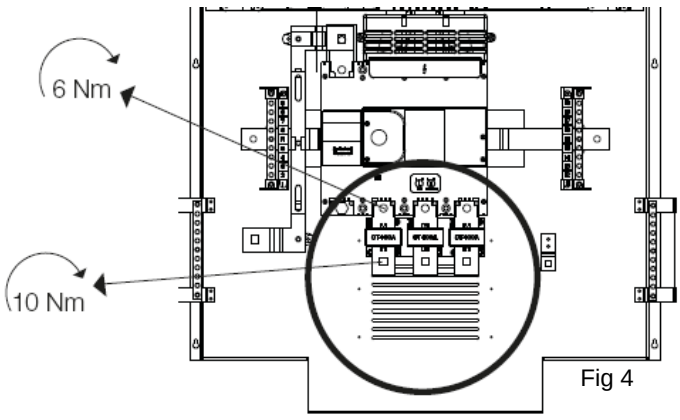


Fig 4

1.3. Incoming Meter Fitment

Step 1: Fit side extension box to panel board using the fasteners supplied and remove bottom meter blank as necessary.

Step 2: Fit meter into available cut out. Note the meter has no additional fixing fasteners and is retained by moulding integral to the casing, fig 5.

Step 3: Fit CT loom to meter at bottom connector position as per figure 6.

Step 4: Fit meter loom to main voltage tap off fuse loom and terminate to connector position V IN. IF outgoing metering is also used then voltage should be supplied from the nearest outgoing meter (follow meter looping instructions section 2.3)

Fig 5

Fig 6

2.0. Outgoing Metering (PSPBL160SW, PSPBL250SW)

2.1. CT Fitment

Step 1: Remove CT shorting link and retain for future use as per figure 7.

Step 2: Connect CT Loom to CT by pushing plug connector as per figure 8 and fastened as necessary.

Step 3: Align CT ground cable ring terminal with CT mounting foot and place fastener to retain grounding cable.

Step 4: Fit CT to mounting plate using the supplied fasteners. This can be completed before or after cables have been passed through CT aperture.

Note: CT connector should always face away from MCCB and denoted LHS for mounting of left hand side of panel board or RHS when mounting on right hand side of panel board

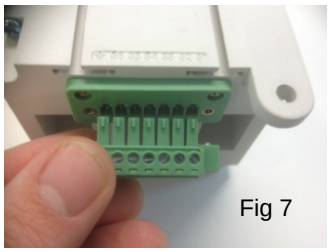


Fig 7

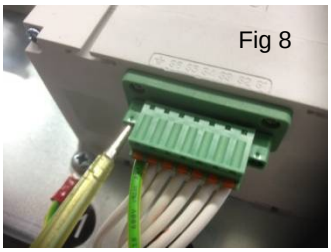
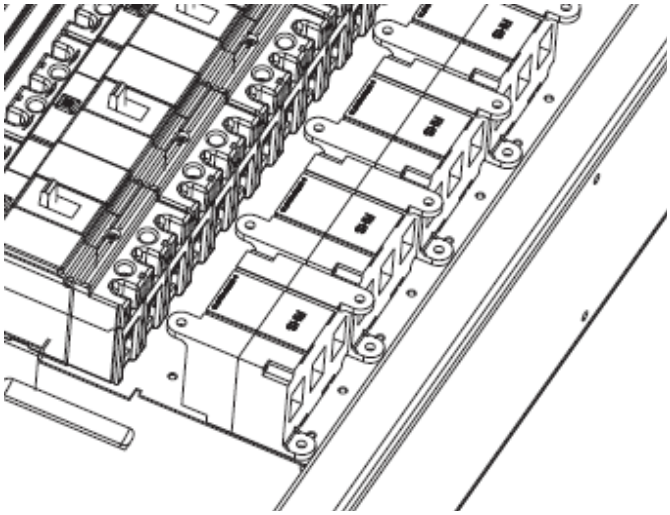


Fig 8



2.2. Meter Fitment

Step 1: Fit side extension box to panel board using the fasteners supplied and remove meter blank as necessary, fig 9

Step 2: Fit meter into available cut out. Note the meter has no additional fixing fasteners and is retained by moulding integral to the casing, fig 10.

Step 3: Fit CT loom to meter at bottom connector position as per fig 11.

Step 4: Fit meter loom to main voltage tap off fuse loom supplied within panelboard and terminate to connector position V IN, fig 12 & 13.

Fig 9

Fig 10

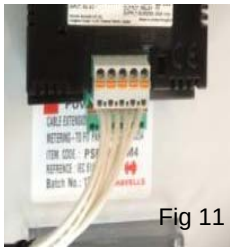


Fig 11

Fig 12

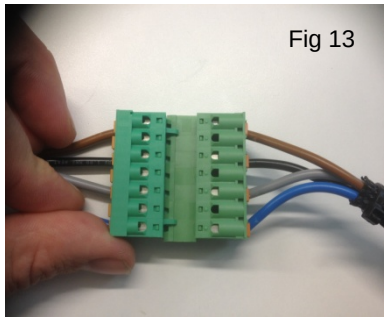


Fig 13

2.3. Looping meter supply

Step 1: Locate connector on first meter marked **V Out**. Using meter loom connect to next meter marked **V IN,** fig 14 and fig 15

Step 2: Replicate as necessary and dress cables as desired using supplied cable tie accessories. Where possible utilize side extension inner tray to keep cables away from obstructions, fig 16.

Note: When using surge protection kit, the surge protection device should be fitted on the mounting bracket provided within the side extension box. In this case the next available meter position should be used.

Fig 14

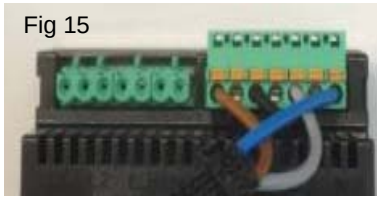


Fig 15

Fig 16

Using Non SmartWire meters

Plug connectors can be remove simply by pressing the orange release button.

For single phase application please contact the office

Pulse/ RS485 connection

Remove the Pulse/RS485 male connector and simply push cables into the corresponding terminal position as labelled. Connect to meter as necessary.

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